National Institute of Environmental Health Sciences

Climate niches of tick species in the mediterranean region: Modeling of occurrence data, distributional constraints, and impact of climate change

Author(s): Estrada-Peña A, Venzal JM
Year: 2007
Journal: Journal of Medical Entomology. 44 (6): 1130-1138

Abstract:

In this study, we used ecological niche factor analysis (ENFA) and principal components analysis (PCA) of climate variables to define the climate niches and areas of potential colonization of six species of ticks in the Mediterranean region: Dermacentor marginatus Sulzer, Rhipicephalus bursa Canestrini & Fanzago, Rhipicephalus turanicus Pomerantsev, Matikashvili & Lototsky, Hyalomma marginatum Koch, Hyalomma excavatum Koch, and Boophilus annulatus (Say). ENFA generated distribution models that varied in accuracy from high to very high (area under the curve [AUC] Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin) 0.87-0.97), with the lowest AUC obtained for B. annulatus. PCA provided an adequate separation of the climate niches of different species in the reduced space of the variables. Climate scenarios and factorial consensus analysis were used to evaluate the geographic impact of climate change (as turnover in habitat suitability) on the niches of the ticks and net variations in habitat availability. The scenario that was most compatible with estimates of future climate in the Mediterranean region (increase in temperature and decrease in rainfall) was predicted to produce a sharp increase in the extent of suitable habitat for R. bursa, R. turanicus, and H. marginatum. This scenario would result in a northward expansion of suitable habitat areas for these three species. The highest impact (highest species turnover) would be recorded at the margin of the current distribution range of the three species. A sensitivity analysis of the ecological response of the ticks to the climate change scenarios showed that the response is statistically different in different regions of the PCA-derived niche. These results outline the need to further investigate the potential of bioclimate models to obtain accurate estimations of tick species turnover under conditions of climate change over wide areas.

Source: http://dx.doi.org/10.1093/jmedent/44.6.1130 http://www.ncbi.nlm.nih.gov/pubmed/18047215

Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: author defined scenarios

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure : ☑

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Temperature

Temperature: Fluctuations

Geographic Feature: ☑

resource focuses on specific type of geography

Ocean/Coastal

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Africa, Europe

African Region/Country: African Region

Other African Region: Mediterranean region

European Region/Country: European Region

Other European Region: Mediterranean region

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Tick-borne Disease

Tick-borne Disease: General Tick-borne Disease

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Short-Term (

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content